

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:  
a semiconductor layer having a crystalline structure on an insulating  
surface, the semiconductor layer having at least a source region, a drain region and  
a channel region,  
wherein the channel region contains a rear gas element having a  
concentration gradient.
- 10        2. A semiconductor device according to claim 1, wherein the rear gas  
element is one or a plurality of elements selected from the group consisting of He,  
Ne, Ar, Kr and Xe.
- 15        3. A semiconductor device according to claim 1, wherein the  
semiconductor device is a liquid crystal display device.
- 20        4. A semiconductor device according to claim 1, wherein the  
semiconductor device is an EL display device.
- 25        5. A semiconductor device according to claim 1, wherein the  
semiconductor device is at least one selected from the group consisting of a  
personal computer, a video camera, a mobile computer, a goggle type display, a  
player using a recording medium, a digital camera, a projector, a portable  
telephone, and a portable book.
6. A semiconductor device comprising:  
a semiconductor layer having a crystalline structure on an insulating  
surface, the semiconductor layer having at least a source region, a drain region and

a channel region,  
an insulating film on the semiconductor layer,  
wherein a rear gas element is contained between the channel region and  
the insulating film.

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7. A semiconductor device according to claim 6, wherein the rear gas  
element is one or a plurality of elements selected from the group consisting of He,  
Ne, Ar, Kr and Xe.

10 8. A semiconductor device according to claim 6, wherein the  
semiconductor device is a liquid crystal display device.

9. A semiconductor device according to claim 6, wherein the  
semiconductor device is an EL display device.

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10. A semiconductor device according to claim 6, wherein the  
semiconductor device is at least one selected from the group consisting of a  
personal computer, a video camera, a mobile computer, a goggle type display, a  
player using a recording medium, a digital camera, a projector, a portable  
20 telephone, and a portable book.

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11. A semiconductor device comprising:

a first semiconductor layer having a crystalline structure on an insulating  
surface;

a second semiconductor layer in contact with the first semiconductor layer;  
an insulating film in contact with the second semiconductor layer; and  
an electrode in contact with the insulating film,  
wherein the second semiconductor layer contains a rear gas element.

12. A semiconductor device according to claim 11, wherein the second semiconductor layer has a crystalline structure.

5        13. A semiconductor device according to claim 11, wherein the second semiconductor layer has an amorphous structure.

14. A semiconductor device according to claim 11, wherein the rear gas element is one or a plurality of elements selected from the group consisting of He,  
10 Ne, Ar, Kr and Xe.

15. A semiconductor device according to claim 11, wherein the semiconductor device is a liquid crystal display device.

15        16. A semiconductor device according to claim 11, wherein the semiconductor device is an EL display device.

17. A semiconductor device according to claim 11, wherein the semiconductor device is at least one selected from the group consisting of a  
20 personal computer, a video camera, a mobile computer, a goggle type display, a player using a recording medium, a digital camera, a projector, a portable telephone, and a portable book.

18. A semiconductor device comprising:  
25        a semiconductor layer having a crystalline structure on an insulating surface;  
            a gate insulating film adjacent to the semiconductor layer,  
            wherein the semiconductor layer contains a rear gas element having a

concentration gradient along a direction perpendicular to the insulating surface.

19. A semiconductor device according to claim 18, wherein the rear gas element is one or a plurality of elements selected from the group consisting of He,  
5 Ne, Ar, Kr and Xe.

20. A semiconductor device according to claim 18, wherein the semiconductor device is a liquid crystal display device.

10 21. A semiconductor device according to claim 18, wherein the semiconductor device is an EL display device.

22. A semiconductor device according to claim 18, wherein the semiconductor device is at least one selected from the group consisting of a  
15 personal computer, a video camera, a mobile computer, a goggle type display, a player using a recording medium, a digital camera, a projector, a portable telephone, and a portable book.

23. A semiconductor device comprising:  
20 a semiconductor layer having a crystalline structure on an insulating surface;  
a gate insulating film adjacent to the semiconductor layer,  
wherein the semiconductor layer contains a rear gas element, a first portion of the semiconductor layer having a higher concentration of the rare gas  
25 element than a second portion of the semiconductor layer, wherein the first portion is closer to the gate insulating film than the second portion.

24. A semiconductor device according to claim 23, wherein the rear gas

element is one or a plurality of elements selected from the group consisting of He, Ne, Ar, Kr and Xe.

25. A semiconductor device according to claim 23, wherein the  
5 semiconductor device is a liquid crystal display device.

26. A semiconductor device according to claim 23, wherein the  
semiconductor device is an EL display device.

10 27. A semiconductor device according to claim 23, wherein the  
semiconductor device is at least one selected from the group consisting of a  
personal computer, a video camera, a mobile computer, a goggle type display, a  
player using a recording medium, a digital camera, a projector, a portable  
telephone, and a portable book.

15 28. A method for manufacturing a semiconductor device comprising the  
steps of:

adding a metal element to a first semiconductor film having an amorphous  
structure;

20 crystallizing the first semiconductor film;

forming a barrier layer on a surface of the first semiconductor film after  
the crystallizing step;

forming a second semiconductor film on the barrier layer;

adding a rear gas element to the second semiconductor film;

25 gettering the metal element to the second semiconductor film to selectively  
remove or reduce the metal element in the first semiconductor film; and  
removing the second semiconductor film.

29. A method for manufacturing a semiconductor device according to claim 28, wherein the rear gas element is added also to the first semiconductor film.

5        30. A method for manufacturing a semiconductor device according to claim 28, wherein a region selectively added with the rear gas element is formed in a part of the first semiconductor film.

10      31. A method for manufacturing a semiconductor device according to claim 28, wherein the rear gas element is added also to the first semiconductor film to form a layer containing the rear gas element.

15      32. A method for manufacturing a semiconductor device according to claim 28, wherein the gettering step is conducted by a heat treatment.

20      33. A method for manufacturing a semiconductor device according to claim 28, wherein the gettering step is conducted by irradiating the first semiconductor film with a light.

25      34. A method for manufacturing a semiconductor device according to claim 28, wherein the gettering step is conducted by a heat treatment and irradiating the first semiconductor film with a light after the heat treatment.

35. A method for manufacturing a semiconductor device according to claim 33, wherein the light is at least one selected from the group consisting of a halogen lamp light, a metal halide lamp light, a xenon arc lamp light, a carbon arc lamp light, a high-pressure sodium lamp light, and a high-pressure mercury lamp light.

36. A method for manufacturing a semiconductor device according to claim 28, wherein the metal element is one or a plurality of elements selected from the group consisting of Fe, Ni, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

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37. A method for manufacturing a semiconductor device according to claim 28, wherein the rear gas element is one or a plurality elements selected from the group consisting of He, Ne, Ar, Kr and Xe.

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38. A method for manufacturing a semiconductor device according to claim 28, wherein the semiconductor device is a liquid crystal display device.

39. A method for manufacturing a semiconductor device according to claim 28, wherein the semiconductor device is an EL display device.

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40. A method for manufacturing a semiconductor device according to claim 28, wherein the semiconductor device is at least one selected from the group consisting of a personal computer, a video camera, a mobile computer, a goggle type display, a player using a recording medium, a digital camera, a projector, a portable telephone, and a portable book.